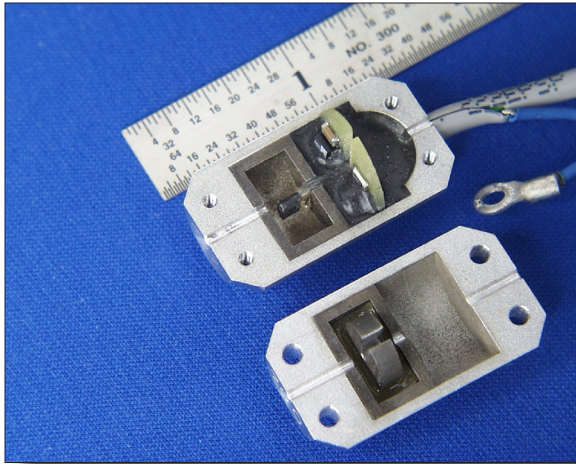




# Innovative Partnerships Program

## Smart Current Signature Sensor



*"Graftel expects that the application of this technology to nuclear power plants will result in cost savings to the plants while at the same time increasing reliability and decreasing occupational dose to plant personnel."*

James Glover, President  
Graftel Inc.

NASA Kennedy Space Center (KSC) has recently partnered with Graftel Incorporated under an exclusive license agreement for the manufacture and sale of the Smart Current Signature Sensor. The Smart Current Signature Sensor and software were designed and developed to be utilized on any application using solenoid valves. The system monitors the electrical and mechanical health of solenoids by comparing the electrical current profile of each solenoid actuation to a typical current profile and reporting deviation from its learned behavior. The objective of this partnership with Graftel is for them to develop the technology into a hand held testing device for their customer base in the Nuclear Power Industry. The device will be used to perform diagnostic testing on electromechanical valves used in Nuclear Power plants. Initially Graftel plans to have working units to show to customers within the first year of the license in order to show customers and allow them to put purchase requests into their next year's budget.

### Success Highlights

- The Smart Current Signature Sensor has received a United States Patent #6,676,912.
- Prototype of the Smart Current Signature Sensor has been fabricated and tested at Kennedy Space Center.
- Technology received several NASA Board Action Awards for technical merit.

### Advantages

- The Smart Current Signature Sensor was designed and developed to be utilized by the Space Shuttle program on its ground support equipment and vehicle valves.
- The Sensor was designed with such flexibility that it could be utilized on any application using solenoid valves.
- The system learns from good solenoid valves and reports deviation from its learned behavior. Therefore, it is suitable for any aerospace application.
- Two major benefits of this software are the automatic identification of the features using a very small sample of the current signature and enhancements to the difference filter that provide a method to control the amount of noise rejection.

NASA success story

## The Technology

The Smart Current Signature Sensor learns from good solenoid valves and reports deviation from its learned behavior. Software running in the microprocessor analyzes the incoming data (recorded valve current signature) and determines the state of the valve: energized, de-energized, or transitioning. It is primarily during the transition phase when the software identifies key features in the current signature and determines the "health" of the valve. Innovative software techniques are used to identify the following features: the time the valve began transitioning, the time of maximum change in current inrush or outrush, the time poppet movement begins, the amplitude of the current required to initiate poppet movement, the time required for the poppet to travel to and seat in its final position, the time energizing current reaches steady state, the amplitude of the energizing current, the minimum required holding current before the poppet unseats, and the time required for the poppet to unseat. From this data, a determination can be made as to the general health of the valve.

## Commercial Applications

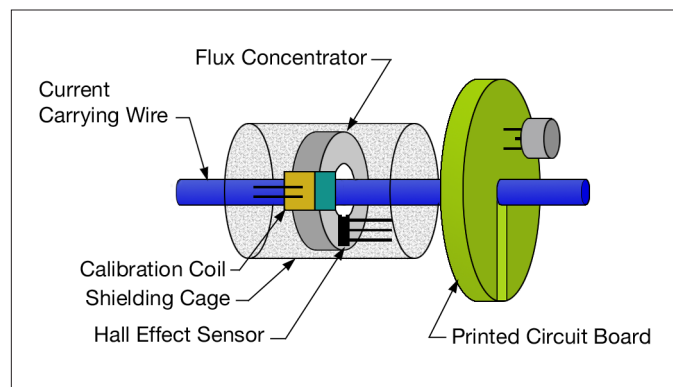
Under an exclusive field of use license, Graftel will identify a specific customer base for application of the products made using the Smart Current Signature Sensor technology. They will develop hand held sensor units and demonstrate their effectiveness to customers in the Nuclear Power Industry. Upon acceptance, the products and/or testing services using the products will be sold to the customers allowing them to validate that valves in their power plants are open or closed and operating correctly.

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